

Amendment

The Examiner is respectfully requested to amend the above-identified application as follows.

IN THE CLAIMS:

Please amend Claims 1, 3-6, 8-12, 14-16, 19-24, 27-29, 32 and 33 as follows. A marked-up copy of Claims 1, 3-6, 8-12, 14-16, 19-24, 27-29, 32 and 33, showing the changes made thereto, is attached. Note that all the claims currently pending in this application, including those not presently being amended, have been reproduced below for the Examiner's convenience.

- a' sub C
-
1. (Amended) A printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:
- discriminating means for discriminating the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;
 - determining means for determining a fundamental pulse width on the basis of driving conditions according to a condition of the printhead; and
 - control means for controlling a driving pulse to be applied to printing elements used in the printing of the printing data, on the basis of the fundamental pulse

a¹
cont.

width determined by said determining means and the number of simultaneously driven printing elements discriminated by said discriminating means.

2. The apparatus according to claim 1, wherein the driving conditions include a wiring resistance, heater resistance, driving TrON resistance, and environmental temperature of said printhead.

a²
sub C¹
cont.

3. (Amended) The apparatus according to claim 1, further comprising:
storage means for storing a first management table for managing the correspondence of the driving conditions with the fundamental pulse width, and a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements; and

second determining means for determining a change amount of the fundamental pulse width, which corresponds to the number of simultaneously driven printing elements, by using the second management table,

wherein said first determining means determines the fundamental pulse width using the first management table, and

said control means changes the fundamental pulse width determined by said first determining means by the change amount determined by said second determining means to generate a driving pulse to be applied to printing elements used in the printing of the printing data.

a2
Cont.
Sub
C1
cont.

4. (Amended) The apparatus according to claim 1, wherein said control means defines the fundamental pulse width by either one of leading and trailing edges of a pulse signal on the basis of the driving conditions, and controls a driving pulse width of a driving pulse to be applied to printing elements by the other of the leading and trailing edges of the pulse signal, on the basis of the number of simultaneously driven printing elements.

5. (Amended) The apparatus according to claim 4, further comprising storage means for storing a first management table for managing the correspondence of the driving conditions with the fundamental pulse width, a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements, and a third management table for managing the correspondence of rise time and fall time of the pulse signal, the driving conditions, and the fundamental pulse width, and

said control means controls a pulse width of the driving pulse corresponding to the number of simultaneously driven printing elements and the driving conditions by using the third management table.

6. (Amended) The apparatus according to claim 1, further comprising a plurality of printheads, and

if power lines for supplying power to said printheads are independent of each other, said control means executes the control for each power line.

7. The apparatus according to claim 1, wherein said control means makes a change amount for the driving pulse, which said control means generates by changing a pulse width of the fundamental pulse when the number of simultaneously driven printing elements is not less than a predetermined value, smaller than a change amount for the driving pulse, which said control means generates by changing a pulse width of the fundamental pulse when the number of simultaneously driven printing elements is less than the predetermined value.

a3
sub
a1
cont.

8. (Amended) The apparatus according to claim 1, wherein said control means, when the number of simultaneously driven printing elements is not more than a predetermined value, sets a pulse width of the driving pulse larger than a pulse width calculated from the fundamental pulse width on the basis of the number of simultaneously driven printing elements.

9. (Amended) The apparatus according to claim 1, wherein if the number of simultaneously driven printing elements for use in predischARGE for recovering said printhead is limited, said control means makes a pulse width of a driving pulse to be applied to printing elements used in the predischARGE larger than a pulse width of a driving pulse to be applied to printing elements for use in printing which uses printing elements not less than the number of simultaneously driven printing elements.

a3
cont.

10. (Amended) The apparatus according to claim 1, wherein when predischARGE for recovering said printhead is to be performed, said control means applies a driving pulse having a predetermined width to printing elements used in the predischARGE.

11. (Amended) The apparatus according to claim 1, wherein each printing element comprises an ink discharge unit comprising an electrothermal transducer for discharging ink by generating a bubble in the ink by heat and a discharge orifice.

12. (Amended) A method of controlling a printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:

a discrimination step of discriminating the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;

a determination step of determining a fundamental pulse width on the basis of driving conditions according to a condition of the printhead; and

a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data, on the basis of the fundamental pulse width determined in said determination step and the number of simultaneously driven printing elements discriminated in the discrimination step.

13. The method according to claim 12, wherein the driving conditions include a wiring resistance, heater resistance, driving TrON resistance, and environmental temperature of said printhead.

ag 4
Guth
cont

14. (Amended) The method according to claim 12, further comprising:
a storage step of storing a first management table for managing the correspondence of the driving conditions with the fundamental pulse width, and a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements; and

a second determination step of determining a change amount of the fundamental pulse, which corresponds to the number of simultaneously driven printing elements, by using the second management table,

wherein the first determination step determines the fundamental pulse width using the first management table, and

the control step comprises changing the fundamental pulse width determined in the first determination step by the change amount determined in the second determination step to generate a driving pulse to be applied to printing elements used in the printing of the printing data.

15. (Amended) The method according to claim 12, wherein the control step comprises defining the fundamental pulse width by either one of leading and trailing

a-4
cont.

edges of a pulse signal on the basis of the driving conditions, and controlling a driving pulse width of a driving pulse to be applied to printing elements by the other of the leading and trailing edges at the pulse signal, on the basis of the number of simultaneously driven printing elements.

16. (Amended) The method according to claim 15, further comprising a storage step of storing a first management table for managing the correspondence of the driving conditions with the fundamental pulse width, a second management table for managing the correspondence of the fundamental pulse width with a change amount of the fundamental pulse width based on the number of simultaneously driven printing elements, and a third management table for managing the correspondence of rise time and fall time of the pulse signal, the driving conditions, and the fundamental pulse width, and

said control step comprises controlling a pulse width of the driving pulse corresponding to the number of simultaneously driven printing elements and the driving conditions by using the third management table.

17. The method according to claim 12, wherein said printing apparatus comprises a plurality of printheads, and

if power lines for supplying power to said printheads are independent of each other, the control step comprises executing the control for each power line.

18. The method according to claim 12, wherein the control step comprises making a change amount for the driving pulse, which the control step generates by changing a pulse width of the fundamental pulse when the number of simultaneously driven printing elements is not less than a predetermined value, smaller than a change amount for the driving pulse, which the control step generates by changing a pulse width of the fundamental pulse when the number of simultaneously driven printing elements is less than the predetermined value.

25
sub
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

19. (Amended) The method according to claim 12, wherein the control step, when the number of simultaneously driven printing elements is not more than a predetermined value, sets a pulse width of the driving pulse larger than a pulse width calculated from the fundamental pulse width on the basis of the number of simultaneously driven printing elements.

20. (Amended) The method according to claim 12, wherein if the number of simultaneously driven printing elements for use in predischARGE for recovering said printhead is limited, the control step comprises making a pulse width of a driving pulse to be applied to printing elements used in the predischARGE larger than a pulse width of a driving pulse to be applied to printing elements for use in printing which uses printing elements not less than the number of simultaneously driven printing elements.

Q3
cont.
LH
cont.

21. (Amended) The method according to claim 12, wherein when predischARGE for recovering said printhead is to be performed, the control step comprises applying a driving pulse having a predetermined width to printing elements used in the predischARGE.

22. (Amended) The method according to claim 12, wherein each printing element comprises an ink discharge unit comprising an electrothermal transducer for discharging ink by generating a bubble in the ink by heat and a discharge orifice.

23. (Amended) A computer-readable memory storing program codes of control of a printing apparatus for performing printing by using a printhead having a plurality of printing elements, comprising:

a program code of a discrimination step of discriminating the number of simultaneously driven printing elements of said plurality of printing elements when printing data is printed;

a program code of a determination step of determining a fundamental pulse width on the basis of driving conditions according to a condition of the printhead; and

a program code of a control step of controlling a driving pulse to be applied to printing elements used in the printing of the printing data, on the basis of the fundamental pulse width determined in said determination step and the number of simultaneously driven printing elements discriminated in the discrimination step.

as cont. sub c, art.

24. (Amended) The apparatus according to claim 1, wherein the fundamental pulse width is selected and determined from a plurality of fundamental pulse widths.

25. The apparatus according to claim 1, wherein the driving conditions are conditions including printhead characteristics.

26. The apparatus according to claim 3, wherein said second management table holds as an index value a change in fundamental pulse width which is based on the number of simultaneously driven printing elements.

a⁶ sub c, art.

27. (Amended) The apparatus according to claim 26, further comprising another management table representing a relationship between the change in fundamental pulse width and the index value, the other management table being prepared for each printing mode.

28. (Amended) The apparatus according to claim 27, wherein one of the printing modes is a mode for performing printing complementarily in accordance with a printing pass count.

Sub
Q6
cont.

29. (Amended) The method according to claim 12, wherein the fundamental pulse width is selected and determined from a plurality of fundamental pulse widths.

30. The method according to claim 12, wherein the driving conditions are conditions including printhead characteristics.

31. The method according to claim 14, wherein said second management table holds as an index value a change in fundamental pulse width which is based on the number of simultaneously driven printing elements.

Sub
Q7
cont.

32. (Amended) The method according to claim 31, further comprising another management table representing a relationship between the change in fundamental pulse width and the index value, the other management table being prepared for each printing mode.

33. (Amended) The method according to claim 32, wherein one of the printing modes is a mode for performing printing complementarily in accordance with a printing pass count.
